The MONTHLY REVIEW

Published Monthly by the

American Electroplaters Society

JAN 19 193

A SOCIETY FOR THE ADVANCEMENT OF THE SCIENCE OF ELECTROPLATING

FEBRUARY, 1931

Entered as second class matter at the Post Office at Springfield, Mass., September 5, 1930, under act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of February 28, 1925, authorized September 5, 1925.

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Published by the
American Electroplaters Society
Publication and Editorial Office
90 Maynard St., Springfield, Mass.

VOL. XVIII FEBRUARY, 1931 No. 2

EDITORIAL

THE FOREMAN PLATER

The foreman plater has always been an important figure in the factory personnel. His ability as a craftsman has much to do with the selling qualities of the articles his firm manufactures.

He is consulted about design when the engineering department makes their plans, and by his wisdom and experience he can visualize shop difficulties, because he realizes the trouble involved when it comes to the final finish both in polishing and plating of shapes that are hard to reach with a wheel, and hard to cover with a deposit. This same individual attends the meeting of the cost-reduction committee and appreciates the value of keeping up-to-date with the newest type of machinery, and although sympathetic in overcoming prejudice amongst his employees where new ideas are introduced, he is mindful, too, that competition is keen, and in order to keep abreast of the times his factory must keep down the cost of producing to a minimum.

With the purchasing department the boss plater should be on the friendliest terms. Many a problem has been solved by the plater because the purchasing agent introduced him to someone who already had experienced the same trouble and willingly gave the information necessary to a successful solution of the difficulty. On the other hand, the plater, because of his contact with others of his craft, can in many cases do the purchasing department a good turn by keeping him informed of new methods and experiences especially where lower cost of material is concerned. Inasmuch as salesmen representing the plating, lacquering, enameling and polishing industries are acquainted with the problems of the plater, it can be readily seen that a mutual understanding between the foreman

plater and purchasing department can be of great benefit to the parties concerned.

The inspection and production departments in the factory come very close to the foreman plater. Here he has to satisfy the one with quality and the other with quantity, and we all realize how the two sometimes conflict with the result that unpleasantness manifests itself. In such a case the plating-room executive has to practise self-control, and rise above the petty annoyances which if taken seriously will sometimes work to the detriment of the organization.

Cooperation with the production department is a big part of the plater's job, especially where the feeder and assembly sections have to depend on the plating-room for their daily production. A corps of men trained to be accommodating is a big help and very desirable when sudden changes from one job to another are necessary in order to keep the various assembly operations running.

Thanks to the American Electro-Platers' Society, the majority of men in charge of plating-rooms are now being trained in plating-room control and the analysis of solutions. Other things are also being impressed upon them, such as loyalty to their company, the necessity of economy in the use of materials and equipment, the welfare of their help, especially where health hazards are concerned, and the necessity of keeping up to date on the job. With these qualifications the foreman plater can easily approach the management when assistance is needed for our Society and Research Fund, because the great leaders in American industry realize how valuable the foreman plater is and are willing to support him and the organization he belongs to in order to place the American Electro-Platers' Society on a higher plane.

"UNSOLVED PROBLEMS IN CHROMIUM PLATING"

Summary of Address by W. Blum

Philadelphia Branch, American Electroplaters Society, November 22, 1930

While great progress has been made in the commercial applications of chromium plating there are still many problems upon which more exact knowledge is desirable. The solution of such problems is especially important in order to permit chromium plating to meet the present competition with the chromium alloy steels and to thus insure that chromium plating will be used wherever it is not efficient and most satisfactory. In addition it is quite probable that any uses for chromium plating that may be developed from time to time

will demand more exact knowledge of certain factors than is now available.

The following remarks apply especially to the researches that are in progress at the Bureau of Standards. It should be borne in mind, however, that researches on chromium plating, including some of these same problems, are also in progress in other institutions from which reports are published at intervals.

Theory of Chromium Plating:

Any fundamental improvements in chromium plating are likely to depend upon a better understanding of the theory and mechanism of the process. Thus far no clear theory of chromium plating has been developed, largely because exact information is lacking on several points. At present Dr. C. L. Kasper is making a study at the Bureau of Standards of the theory of chromium plating in which the effects of various materials upon the conductivity and other properties of the solution will be determined. In this investigation all promising methods of attack will be used in order to determine, for example, why sulphate is necessary in a chromium plating bath, and why trivalent chromium affects the results.

Hardness and Wear Resistance:

Chromium is being extensively applied for resistance to wear. One difficulty in defining the best conditions to be used in chromium plating for this purpose is the difficulty of measuring the hardness and wear resistance. Recent work upon the wear of chromium plated gauges, conducted in the Metallurgy Division of the Bureau, indicated that the most important factor is to have the chromium surface as smooth as possible before subjecting the article to wear. This may be accomplished either by plating thin bright coatings or by depositing thicker coatings and lapping these to a high finish. It was also found that by heating the chromium deposit the life of the gages was somewhat increased. This indicates that by driving out hydrogen the chromium was made tougher and thus more resistant to wear. Further studies are needed upon the effects of hydrogen upon the properties of the chromium.

Protective Value Against Corrosion:

The most important problem today in the application of chromium plating, for example in the automobile industry, is to obtain the maximum protection against corrosion of surfaces with a final chromium finish. It is generally admitted that the protection against corrosion is determined more largely by the quality

of the copper and nickel plating than by the final chromium coating, Mr. P. W. O. Strausser, the new Research Associate for the American Electroplaters' Society, is now planning to make extensive atmospheric exposure tests upon chromium plated metals to determine what combination of coatings gives the maximum protection. These tests will be made in cooperation with the American Society for Testing Materials, who maintain exposure racks in various localities.

In addition it is desirable to produce chromium deposits with a minimum porosity. Recent results obtained by Mr. A. Brenner at this Bureau have shown that when chromium is deposited at relatively high temperatures, for example 65° C, or 149° F, and a correspondingly high current density, the coatings are much less porous than those produced at lower temperatures. These results are consistent with those recently reported from the General Motors Research Laboratory in which heating of the chromium deposits was advocated to increase their resistance to corrosion. In connection with the atmospheric tests above referred to, experiments will be made to determine whether the chromium deposits that appear to be least porous will furnish appreciably better protection than the ordinary deposits.

To the extent that these problems can be solved in the various laboratories, it is reasonable to predict that chromium plating will be applied more intelligently and more satisfactorily for those purposes for which it is suitable.

THROWING POWER OF CYANIDE COPPER BATHS

An address by Dr. L. C. Pan* before the Hartford Branch of the American Electroplaters' Society, September 22, 1930.

Although the cyanide copper bath is one of the most common plating baths in the modern electroplating shop, it has not been thoroughly studied with respect to the effects of impurities and additions upon the voltage, conductivity, current efficiency, throwing power, and many other properties which are very important to its operations and to the results obtained therefrom. Obviously, the task of thorough investigation is big. The work I did is merely a start in the direction toward a better knowledge of the subject.

There are four chemicals which, except one, are often found in

* Instructor in Electroplating, The College of the City of New York.

the cyanide copper bath, either as regular additions or as impurities. Their influence upon the bath with respect to throwing power, bath voltage and character of deposit, is the subject matter of one of my recent investigations. The four compounds referred to are: sodium carbonate, sodium thiosulfate, sodium hydroxide and sodium chloride.

The essential parts of the apparatus used for the work are a glass battery jar and a modified form of cavity scale, the original of which was fully described in an article published in the June, 1930, issue of the Metal Industry (New York). It was made of a piece of standard ⅜ inch iron pipe, 2 inches long, closed at one end by a brass cap. This test piece was suspended in the cyanide bath with the open end facing a copper anode in the glass jar. For each variation of the bath composition, a deposit was made at room temperature, and a current density of 12.3 amp./sq. ft. for ten minutes. The extent to which copper is deposited inside the pipe was taken as a measure of throwing power of the bath. The numerical value of throwing power is derived in the same way as that on a cavity scale, namely, the depth of deposit in percentage of diameter of the opening or cavity. For example, if the inside of the test piece shows a continuous copper deposit up to 0.4 inch from the opening, and the opening is 0.5 inch in diameter, then the throwing power on the cavity scale is

$$\frac{0.4}{0.5} = 80 \text{ per cent, or simply } 80.$$

If, in another case, the copper deposit extends to a depth of 0.9 inch on the same test piece, the throwing power is then

$$\frac{0.9}{0.5} = 180 \text{ per cent, or simply } 180.$$

The voltage observed during the tests at any given current density is taken as an indication of the electric power required to do the plating on a given amount of surface.

The effect of copper metal content and free cyanide content on the deposit has been repeatedly studied. Results may be found in various places in electroplating literature. The present investigation deals with the effect of sodium carbonate, sodium thiosulfate,

sodium hydroxide and sodium chloride, upon the throwing power and plating voltage of the cyanide copper bath.

For all the experimental work, a standard solution was taken as a starting point and various amounts of other chemicals were added to it:

Copper cyanide, Tech.	2.7 oz. per gal.
Sodium cyanide, C.P.	3.45 oz. per gal.

Upon analysis, the standard solution shows the following composition:

Copper metal	1.92 oz./gal.
Free cyanide, in excess of $Na_2Cu(CN)_3$	0.502 oz./gal.
Carbonate, introduced as impurity	0.2 oz./gal.

The Effect of Sodium Carbonate

Starting with the above solution, sodium carbonate was added in various amounts and a throwing power test was made for each value of carbonate content up to 20 ounces per gallon. Some interesting results were observed. The throwing power of the cyanide copper bath seems to increase with increasing amount of sodium carbonate content until a maximum is reached at 5.3 ounces per gallon. After that, the throwing power drops off and from 10.7 ounces per gallon to 20 ounces per gallon, the throwing power remains at a low level. It was also observed that the bath voltage decreases with increase of sodium carbonate present, which is in contradiction to the general belief that sodium carbonate raises the bath voltage.

The observation made on the surface of the anodes during the tests was rather interesting. When the bath is low in carbonate, the anode takes on a brown film. As the carbonate is increased, this brown film changes into a green one, and at a point where the bath shows the highest throwing power, this green film becomes a blue film which is readily soluble in the bath. When the experiment is carried out in a glass jar, one can watch the blue film dropping off from the anode and disappearing into the bath. With further increase of carbonate content this same phenomena persists. The character of the anode film has a close relationship with the bath voltage. The bath voltage was very high when no carbonate was present. It decreases rapidly with increase of carbonate content, until a point is reached corresponding approximately to the maximum throwing power. From thereon the bath voltage remains

practically at the same point, with a slight decrease with increasing amount of carbonate up to 20 ounces per gallon, which amount is as far as the experiments were carried. Therefore, the general belief that carbonate is detrimental to cyanide plating baths has to be modified to the statement that carbonate is beneficial up to 5.3 ounces per gallon. Beyond that, it is detrimental to the throwing power, while it has apparently no effect on the bath voltage and physical character of the deposit.

Although the polarization of the cathode and anode due to the presence of sodium carbonate is not determined, the author believes that presence of carbonate in the bath reduces anode polarization. This is based upon observation that presence of carbonate in the bath actually dissolves the film originally present on the anode surface, and that even at a high concentration of 20 ounces per gallon, there is no formation of copper carbonate coating on the anode surface. Therefore, sodium carbonate has an effect of depolarizing rather than polarizing the anode. This also explains the lower bath voltage at higher concentration of carbonate.

The Effect of Sodium Thiosulphate

Although sodium thiosulphate is a well-known brightener for the cyanide copper baths, its effect upon the throwing power of that bath has not been studied by previous investigators. It is true that the amount of sodium thiosulphate permissible in copper cyanide baths is rather limited. We have to work in a range of low concentrations and it is surprising that the presence of this material in a concentration as small as 0.013 ounce per gallon shows a definite effect on the character of the deposit.

The brightening effect of thiosulphate begins to show as soon as the least amount of the thiosulphate was added. A maximum throwing power was indicated on the modified cavity scale to be at a thiosulphate content of 0.013 to 0.067 ounces per gallon. The bath voltage did not seem to be much affected by the presence of sodium thiosulphate in any appreciable amount up to 0.283 oz./gal.

Cyanide copper baths containing no carbonates and other impurities have a very high bath voltage. This high voltage is not reduced by the presence of sodium thiosulphate in quantities commonly used.

This series of experiments shows one very important fact, that a copper cyanide bath containing low free cyanide and sodium

thiosulphate, and no other chemicals or impurities, is not a practical bath on account of the high bath voltage. Incidentally, another point of interest may be mentioned here, that with the concentration of the sodium thiosulphate more than 0.067 ounce per gallon, brown spots appeared on the plate, which is very similar to stain spots commonly seen on brass plated articles, otherwise the deposit remains bright.

The Effect of Sodium Hydroxide

Sodium hydroxide is not an ingredient in any standard cyanide copper bath, but is sometimes used to increase the conductivity of the baths. Its effect is beneficial in more than one way. First, it increases the conductivity of the bath. Secondly, the throwing power of the bath is increased enormously by the presence of sodium hydroxide. Sodium carbonate on the modified cavity scale has a throwing power of 290 at a maximum, but sodium hydroxide shows a maximum of 425 on the same scale. Only 2.1 ounces of sodium hydroxide per gallon are required to attain this maximum throwing power. Sodium hydroxide also compares favorably with sodium thiosulphate in throwing power.

Due to its high conductivity and its depolarizing effect on the anode, the voltage of the baths is very much reduced by the presence of sodium hydroxide. Using the standard copper cyanide solution described above, the bath voltage, when sodium hydroxide is added to 6.12 oz./gal., drops from over 16 volts down to 2.2 volts. Further additions of sodium hydroxide might bring the bath voltage still lower.

The deposit from bath containing sodium hydroxide has a velvety matt finish, and apparently finer grained.

The Effect of Sodium Chloride

Sodium chloride has never before been introduced in cyanide copper baths, so far as published data is concerned. The present series of experiments was carried out for the purpose of determining what effect chlorine has on a cyanide copper bath.

Sodium chloride was added to the standard solution in amounts from 0 to 5.34 ounces per gallon. The voltage of the baths and the throwing power were observed. A few interesting points may be mentioned as follows.

The throwing power of the bath was increased by the addition of sodium chloride until a maximum is reached at about 3 ounces per gallon. Beyond that the throwing power factor dropped at the same rate as it is raised. The amount of improvement of the throwing power due to sodium chloride is, however, not as much as that due to sodium carbonate, sodium thiosulphate, or sodium hydroxide.

The effect of sodium chloride upon the bath voltage is more marked. Starting with the high voltage of pure copper cyanide baths, the bath voltage drops rapidly to about 4 volts at a concentration of 1.87 ounces of sodium chloride per gallon. Beyond that, the bath voltage is raised again. The effect of sodium chloride upon anode polarization is very marked. The anode film changes from brown to green as sodium chloride concentration is increased. With more than 2 ounces of the salt per gallon, the green anode film turns to a darker shade, but in all cases there was not any visible sign that the anode film is being dissolved by the electrolyte. The deposit in the presence of sodium chloride is a very bright one. Here, perhaps, is a possibility of getting a bright deposit without the disadvantages of sodium thiosulphate. Electroplaters who desire a bright copper deposit which is to be oxidized may well try it.

Formulas Recommended

Having studied these four different chemicals in cyanide copper baths, we can easily write a formula most suitable for each particular purpose. For instance, if we wish to have bright copper deposits, not to be oxidized afterwards, we could use the following formula:

Formula 1

Copper cyanide	2.7 oz./gal.
Sodium cyanide	3.5 oz./gal.
Sodium carbonate	3 oz./gal.
Sodium thiosulphate	0.06 oz./gal.

The deposit from this bath is bright; the throwing power is higher than any of the baths previously studied, being 433 on the modified cavity scale. Bath voltage was 3.82 at a current density of 12.3 amp./sq. ft.

When we added 2.14 ounces per gallon of sodium hydroxide to the above bath, the throwing power remained the same, but the deposit became dull, while the voltage of the bath dropped about 25%.

If we wish to avoid excess carbonate due to oxidation of sodium cyanide by air, we could start with a solution containing no carbonate. Either of the following two formulas will serve the purpose:

FORMULA 2

Copper cyanide	2.7 oz./gal.
Sodium cyanide	3.5 oz./gal.
Sodium chloride	3.0 oz./gal.
Sodium thiosulphate	0.06 oz./gal.

The deposit from this bath is bright, the anode remains clean, and the bath voltage is low, being 3.3 volts at 12.3 amp./sq. ft. The throwing power of this bath is equally high as that of Formula 1 bath.

FORMULA 3

Copper cyanide	2.7 oz./gal.
Sodium cyanide	3.5 oz./gal.
Sodium hydroxide	2.2 oz./gal.

The deposit from this bath is dull and bath voltage very low, being 2.9 volts at 12.3 amp./sq. ft. Throwing power in this case on the modified cavity scale is over 425.

From these studies, it has been definitely shown that by adding sodium compounds to cyanide copper baths, whether it be sodium hydroxide or sodium chloride, or sodium carbonate, the bath voltage may be brought down, the throwing power raised up. The character of deposit is much influenced by the material introduced and a proper choice of the chemicals used will depend upon the particular kind of finish desired.

TUESDAY, JULY 1, 1930

Morning Session

"BUFFER ACTION IN NICKEL PLATING SOLUTIONS"

By K. PITSCHNER

Read at the Washington, D. C. Convention, 1930

Control of hydrogen ion concentration in operation of nickel plating baths has been recognized to be of prime importance for several years. With the usual solutions operated under ordinary conditions satisfactory deposits are obtained through a very narrow range of pH the limits of which are approximately 5.0 to 5.5, measured

electrometrically. In order to maintain the pH within these close limits, the careful plater finds it necessary to make frequent determinations either colorimetrically or with the quinhydrone electrode. From the information thus gained he is enabled to detect unfavorable trends in the operating qualities of the solution and make additions of acid or alkali which will forestall probable trouble later on.

It has been found that certain reagents, which are now common constituents in nickel plating solutions, have the property of depressing the tendency towards large changes in pH, thus simplifying control of this important factor. Chief among these reagents are boric hydrofluoric, citric and tartaric acids which belong to the class known as weak acids. The extent to which the hydrogen ion concentration is controlled by these reagents depends on their concentration. This property, known as buffer action, has been defined by W. M. Clark as the resistance to change of pH exhibited by a solution when it is subjected to gain or loss of acid or alkali. The extent to which this action takes place varies greatly at different pH values.

An investigation carried on by Mr. Wm. Baulieu and myself in the laboratory of the Bridgeport Brass Company indicates that common constituents of nickel baths other than weak acids exert a very marked effect on the extent of buffer action. The study was confined to solutions of the compositions shown in the table. The extent of buffer action is evaluated by the method described by Van Slyke. It is the differential ratio of the increment in gram equivalents of strong acid or base added per liter of the solution to the resultant increment or change of pH. Under this definition a solution has a buffer action of 1 unit when a liter of solution requires one gram equivalent of strong acid or base to produce a unit change in pH.

All measurements of pH in the course of the investigation were made electrometrically using the quinhydrone and saturated calomel electrodes in conjunction with a potentiometer, standardized against M/20 acid postassium phthalate. The data for each of the above solutions was obtained on duplicate 100 c.c. samples as follows:

1st: The pH was adjusted to above 6.0 by addition of ammonium hydroxide and stirring until the precipitate of nickel hydroxide was dissolved.

2nd: The samples were titrated with dilute sulphuric acid con-

taining 10% by volume of acid, 1.835 specific gravity. Acid of this strength was used in order to prevent excessive dilution of the sample during the course of the titration as well as to simplify calculations. A drop titration method was used in all runs because of the small volume of titrating reagent involved. The drop volume was carefully determined for the burette and titrating solution and found to be .0435 c.c. The pH was measured at sufficiently frequent intervals to give smooth, reliable curves.

3rd: Curves of pH versus acid additions were drawn from this data.

4th: The values for buffer effect in the table were determined from the slope of the curves at intervals of .5 from 6.0 pH to 2.5 pH. It was found that this method gave a better approximation than the use of increments of acid and pH because of the rapidly changing buffer action at certain points on the curves.

The data in the table shows the following:

1. That buffer effect is highest at the upper end of the pH range—reaching its maximum at the pH where nickel hydroxide begins to precipitate out.
2. That the buffer effect is least in the vicinity of pH 4.0, being only 1/20th to 1/100th of the value at pH 6.
3. That the pH again increases rapidly near the lower end of the scale, being about ten times the value at pH 2.5 that it is at the low point around pH 4. This is probably one of the contributing factors in the successful nickel plating around pH 2 which was described by W. M. Phillips at the Rochester meeting.
4. In the usual plating range of pH 6 to 5 the buffer effect is more noticeable when alkali is added than when acid is added, while in the lower range mentioned before the reverse is the case.
5. That buffer effect is about three times as great at pH 5.5 as at pH 5.
6. Below pH 4, boric acid has little buffer effect in quantities up to 4 ounces per gallon. At pH 5.5 the presence of 4 oz. per gallon doubles the buffer effect as compared with solutions with no boric acid present. At pH 6 the buffer effect is about 3½ times that when no boric acid is present.
7. Increasing nickel sulphate concentration markedly increases buffer effect above pH 4. In comparing Runs No. 6 and No. 15, which used the same solution composition except for nickel con-

tent, it will be noted that doubling the nickel content has increased the effect to about four times the value at pH 5, three times at pH 5.5 and two times at pH 6.

8. Increasing ammonium chloride concentration increases the buffer effect considerably, above pH 4, as shown by comparison of Runs No. 6 and No. 13, which have the same solution composition except for ammonium chloride content.
9. It is probable that any considerable quantities of soluble salts will have the same effect on buffer action that nickel sulphate and ammonium chloride show.

A slight modification of the method of procedure employed in this work was found to be well adapted to regulating the pH of nickel baths in constant service. The titration is made as follows:

100 c.c. of the nickel solution is pipetted out and sufficient quinhydrone added to saturate it. The salt bridge of the calomel electrode and the platinum indicator electrode are immersed in the nickel solution and the pH read by means of the potentiometer. If the value found does not coincide with the desired pH value, the potentiometer dial is set to the millivoltage corresponding to the desired pH. The standard acid is then added drop by drop; the drops being counted until the galvanometer needle registers zero. From the number of drops of 10% (by volume) acid used, the strong acid needed to lower the pH to the desired value is calculated as follows:

c.c. strong acid required: drops 10% acid X drop Vol X Sol.
Vol. in Liters.
: drops 10% acid X drop Vol X Sol.
Vol. X 3.785 in Gal.

From this equation a factor may be worked out for each bottle under control.

It was found that by this method a single addition of acid would regularly bring the pH of the various solutions to within .05 of the desired value, thus eliminating the cut and try method commonly used in making additions. The actual determination requires less than five minutes.

It has been our practice to hold the ammonium chloride content of nickel solutions sufficiently high so that the anode corrosion will keep the trend of pH towards the upper limit of the range and so that additions of acid only are necessary, thus simplifying control.

TABLE

Run No.	*2*	*4*	*6*	*9*	*10*	*13*	*15*
NICKEL CONTENT:							
gm/L	30	30	30	30	30	60	30
oz.gal.	4	4	4	4	4	8	4
BORIC ACID:							
gm/L	0	7.5	15	22.5	30	15	15
oz.gal.	0	1	2	3	4	2	2
AMMONIUM CHLORIDE:							
gm/L	15	15	15	15	15	15	30
oz.gal.	2	2	2	2	2	2	4
VAN SLYKE UNITS:							
at pH 6.0	.0464	.0687	.1240	.1545	.1545	.2429	.1548
at pH 5.5	.0231	.0231	.0260	.0334	.0451	.0740	.0742
at pH 5.0	.0068	.0074	.0079	.0100	.0126	.0284	.0226
at pH 4.5	.0024	.0030	.0026	.0044	.0049	.0066	.0057
at pH 4.0	.0021	.0017	.0028	.0014	.0024	.0033	.0027
at pH 3.5	.0040	.0046	.0046	.0041	.0038	.0040	.0035
at pH 3.0	.0071	.0082	.0084	.0102	.0076	.0086	.0076
at pH 2.5	.0309	.0300	.0310	.0340	.0475	.0834	.0208
C.C. of H_2SO_4 1.835 sp.gr. to change 100 gal. of Sol. from 6.0 to 5.0 pH	274	298	345	452	573	945	704

DR. WM. BLUM: Mr. Chairman, I would like to start something. This whole subject this morning is on the control of nickel solutions, and it is hard to discuss one part of it without anticipating some of the things coming on later, but I think that is worth while just to see how involved the question is. After all, these facts that Mr. Pitschner has brought out are just the things that we need to enable us to make predictions and get satisfactory methods of control. On the other hand, there are so many other conditions such as will be brought out by Mr. Phillips and Mr. Mougey that we can't reach a single conclusion and say, "That's that." I want to call attention to one point here which is frankly a surprise to me. If anybody had asked me whether if you had a solution, a strong nickel solution, with eight ounces per gallon you should have more boric acid, I would say "Yes," because it seems natural if you have a stronger nickel solution to put more boric acid in. You are putting it in for buffer action. Actually, these results show that increasing your nickel content has more effect than the boric acid; therefore,

the more nickel you put in, the less boric you need. If you take a solution with four ounces of nickel, it would be better to run your boric acid up to four ounces per gallon to get a good buffer action. On the other hand, if you have a high nickel content, you don't need the boric acid because the nickel sulphate itself is serving as a buffer there.

So you see how facts change our opinions. In other words, I simply assumed, as I suppose most people would, that the stronger the nickel solution,—say if you had a high nickel content, say eight ounces per gallon, you should put in six ounces of boric acid, especially in a warm solution; whereas this shows the effect is quite different from what we would expect.

And in the same way you see that increase in the content of ammonium chloride makes a difference. Now it would be interesting to know whether that difference was due to chloride; in other words, whether you got it just the same whether you added ammonium chloride or sodium chloride or nickel chloride, or whether it is due to the ammonium content. I think it is due to the ammonium, for the reason that your nickel sulphate or ammonium chloride or acid salts seem to hydrolize and liberate acid which tends to give them a buffer action.

Then there is another thing which is anticipating somewhat what Mr. Phillips and Mr. Mougey will say, and that is that all this buffer action is down the bottom here, around, as Mr. Pitschner has said, it is best around pH 5 to 6. Now then, if you are working at from 2 to 4, why these figures, interesting as they are, don't help you very much. They simply show that it doesn't make much difference what composition of solution you have, that you are going to have very little buffer action if you are working at a low pH, that is, around 2 to 4; although, as Mr. Pitschner pointed out, it does shade off again when you get down to a very low pH. So it may be there are two ranges of nickel deposition that are good, and in between is rotten, because you have no buffer action. Now those are just suggestions, but it shows how complicated the situation is.

Dr. A. K. Graham: I would like to ask a question to clear up a point. You have stated, Mr. Pitschner, that you varied the ammonium chloride from 2 to 4 ounces per gallon and that the nickel content was four ounces. In a solution where you have four ounces of metal, and your ammonium chloride would be four ounces, you would have a saturation of the double salt. Did you note whether

your metal content fell off due to precipitation under those conditions?

MR. PITSCHNER: I don't believe there was any precipitation at that point. I believe Mr. Baulieu will check me on that. We didn't notice any precipitation at that point.

EFFECTS OF ACIDS AND ALKALIS ON THE pH OF NICKEL BATHS

By W. Lockerbie

Read at Washington Convention, 1930

The chemical class of the Chicago Branch, A. E. S., has adopted the Sizelove titration method for control of pH nickel solutions. It has an advantage over the colorimetric method in that the amount of addition agents can be determined directly at the time the solution is checked. It is not meant to replace the colorimetric method.

In the colorimetric method we say a solution has so many degrees of acidity, while in the titration method we say its alkalinity is so many cubic centimeters ammonia.

The method consists of titration with standard tenth normal sulphuric acid, using methyl red indicator to a purple color from yellowish green as follows:

Pipette 10 c.c. of solution to be tested.
Add 90 c.c. distilled water.
Add 5 drops methyl red indicator.
Titrate with N/10 sulphuric acid from a burette until the color changes.

This color is best seen while swirling the beaker over a piece of white paper or porcelain and requires close watching.

The procedure must always be carried out the same to get comparative results. If the yellowish green color does not show on addition of the indicator, the solution is already too acid and must be titrated with standard sodium hydroxide solution instead of acid, but since methyl red has a pH of about 5.3 this is seldom necessary as most nickel solutions are operated higher than 5.3 pH or more alkaline.

To determine results, suppose you have a nickel solution which is operating very good, and is just where you would like to keep it in regard to acidity or, as in this method, alkalinity, you would take a sample and on titrating you found 1.4 c.c. N/10 sulphuric acid

were required to make the color change. Then, later you make another check of the nickel solution, and you find that 2.4 c.c. of the standard acid were required. The solution has now become more alkaline and requires a certain amount of acid to bring it back to equal the standard nickel solution you have selected. In this case, 1 c.c. commercial sulphuric acid 66° Be. to each gallon of nickel plating solution will adjust it.

Likewise, if the nickel solution became too acid instead and required only 0.4 c.c. of standard N/10 sulphuric acid, which is 1 c.c. less than your standard nickel solution required, then the number of c.c. less X2.5 equals number of c.c. of commercial ammonia Sp. gr. 0.90 to add to each gallon of the nickel solution to adjust it.

The question arose as to the factors for acids and alkalis other than sulphuric acid and ammonia. They are as follows:

For sulphuric acid, the number of c.c. too alkaline equals the number of c.c. sulphuric acid Sp. g. 1.84 to add to each gallon of plating solution.

For hydrochloric acid, the number of c.c. too alkaline multiplied by 3.2 equals number of c.c. of hydrochloric acid Sp. g. 1.18 to add to each gallon of plating solution.

For hydrofluoric acid, 48% the number of c.c. too alkaline multiplied by 0.8 equals the number of c.c. of hydrofluoric acid to add to each gallon of plating solution.

For ammonia, the number of c.c. too acid multiplied by 2.5 equals the number of c.c. ammonia Sp. g. 0.90 to add to each gallon of plating solution.

For nickel carbonate, the number of c.c. too acid multiplied by 25 equals the number of grams to add to each gallon of plating solution.

For caustic soda, the number of c.c. too acid multiplied by 3 equals number of grams of caustic soda to add to each gallon of nickel plating solution.

For sodium perborate, the number of c.c. too acid multiplied by 5.3 equals the number of grams to add to each gallon of plating solution.

The above factors, excepting the ones for ammonia and sulphuric acid, which were determined by Mr. Sizelove, were determined by the writer and prove very satisfactory.

DR. BLUM: Even if we are limited for time, I don't think we ought to pass over these papers without some discussion. I am going to try to start it, but I hope I won't stop it. This is a splendid opportunity, with Mr. Pitschner's paper still in our minds, to show again the relation between this titration and the determination of acidity and the titration that Mr. Pitschner describes, because you have got three methods of control, all perfectly valid and useful as long as we understand the relation between them. When a man measures the pH of a solution either with the quinhydrone electrode or with an indicator, he gets a certain point, wherever it may be. That is all that he knows. He doesn't know anything more, except it is above or below where he wants it. Now if he had a table like this (indicating Mr. Pitschner's table) for his particular solution, then without making any titration he could tell, as long as he knew the composition of the solution and had a curve for the solution, he could tell how much acid he would have to add to go from one point to another on the curve. That is the value of the curve if the solutions are all of the same composition. But you can see if he had a certain value determined for a solution, and wanted to go from say 5.5 to 6 pH, it would take a certain amount of acid on that one, but it might take three or four times as much for this other one (indicating different solutions referred to by Mr. Pitschner).

The point to remember, in the Sizelove method of titration, is that you are expressing the desired result, not in terms of an exact pH or point on this curve, but the distance you are from that point on the curve which is perfectly fine as long as you have about the same composition of solution. But if, for example, one man, Mr. Lockerbie, may have found that the best result is with 1.7 grams per liter, or c.c. of acid as an alkalinity corresponding to that,—that is perfectly valid for his solution, but suppose the man in the next shop has a solution with twice as much nickel in it? It is no longer 1.7, it is some other value which has to be determined for it.

Now as long as we all know what we are talking about, everyone can get the right result, and, after all, the proof of the pudding is in the eating. We are simply trying to arrive at some spot on this curve, and there are different ways of getting there. There isn't any best way any more than there is any best way from here to Union Station, because it depends on the traffic conditions and everything else, and as long as you get there in time for your train you don't care which way the taxi goes. So

it is exactly the same proposition here, that we are all aiming for the same spot, and there are three different ways, maybe more, of getting there; as long as we know which road we are on it is all right, but we don't want to make a mistake and think we are on one road and follow the directions for another road.

MR. FAINT: Mr. Lockerbie mentions here that the standard for his nickel solution was 1.4 c.c. of tenth normal acid to effect the color change. I have followed this up with a number of other platers, and in one shop where this method is now being used the man has three different large nickel tanks and he has a standard for each tank, because they do different kinds of plating in the different tanks. But the point that we emphasized in Chicago was that for each nickel plating bath you had to get a standard from which to operate, and the reason that this paper was written was because the men asked for the amount of other acids and alkalis to be added for correction other than sulphuric acid and ammonia, so that was the purpose behind this paper. It might also interest you to know that Mr. Lockerbie tried to find a value for boric acid, but the reason I think that his paper is fairly accurate is that Mr. Lockerbie added 60 grams of boric acid to a gallon of nickel solution in an attempt to find a difference in the methyl red method of titration and found none whatsoever, which we would expect, and which he didn't know at the time. So I think his results are accurate because he saw things as they happened and not as they might have happened.

DR. GRAHAM: I don't want to prolong this discussion unduly, but in reply to Dr. Blum, I would like to say it matters considerably what route you take to the depot getting out of Washington. It depends whether you are in a hurry or on a sightseeing trip. And the claim that most of us make for Mr. Sizelove's method is that it is a very rapid method of determining the correct addition of acid or alkali to correct a solution of any volume to its proper operating pH, and it does that automatically. The point that I made a few minutes ago relative to the amount of ammonium chloride added in this determination of this pH curve of Mr. Pitschner's, I think I would like to add to my remark that where you add four ounces per gallon of ammonium chloride and you have four ounces of metal that you are above the saturation value of double salt. Two ounces of nickel, approximately, is the saturation limit at ordinary room temperatures, and that corresponds to a double salt value,

which would have ammonia in it equivalent to three ounces of ammonium chloride. Now with four ounces of metal and four ounces of ammonium chloride, you would be well beyond that, and the question I had in mind was whether the unusual buffer behavior of ammonium chloride, or rather the buffer action Mr. Pitschner found, could not be partly due to some sort of unstable condition he had there at the time he made measurements because he was working with a solution saturated with double salts. It may have been separated out during the time.

"Better Times Are Coming"

Celebrate the coming prosperity by attending the

22nd ANNUAL BANQUET

NEW YORK BRANCH

at Aldine Club, 200 *Fifth Avenue*, New York City

Saturday, February 21, 1931

Educational Session, 3.30 p.m.—interesting papers and discussions, as usual.

For the Ladies, Bridge and Bunco Party, 3.30 to 6 p.m.

BANQUET AT 7 P.M. DANCING ALL EVENING

Banquet Tickets $4.00

A. E. S. PAGE

Assembled Expert Scraps With and Without Significance

The March Edition of the MONTHLY REVIEW will be of great importance. In it will be given a detailed account of the joint meetings of the Executive Board, Research Committee, and the American Society for Testing Materials, held in the Palmer House, Chicago, on January 16, 1931. There will be an outline of the Chicago Branch Educational Society and Annual Banquet held in the same place and in connection with the above named Societies' meetings.

* * * *

Inasmuch as there are no complete records of the A. E. S. since it was founded by Mr. Charles Proctor in 1890, we will endeavor to use all the available information we can collect to place before our readers a complete account of the Societies' activities, its past presidents, and convention meetings since it was first organized. This is a large contract, but the Platers' Society is becoming a powerful influence in the industrial world; and as such its records should be kept up-to-date. Messrs. Proctor, Gehling, Sterling, and Gilbertson are enthusiastic about the idea and have promised their aid. The present editorial staff would appreciate the cooperation of the membership, especially the older members of the Society, to make this "History" a success. Photographs of past presidents will be gladly received.

* * * *

All Hail to our newest branches: Anderson, Ind., and San Francisco, California. Both of these branches have been granted temporary charters.

* * * *

Second Vice-President R. P. Lopez never misses an opportunity to boost the Rochester Convention. Everyone in Chicago knows where Ray comes from, also the date of the convention.

* * * *

"FOR THE GOOD OF THE ORDER"

Our employers have been kind enough to grant us the privilege of attending the important meetings of the A. E. S. In return they receive benefits which cannot be figured in dollars and cents. Would it not be well to make every minute count? The presiding officers at the various educational sessions should insist that meetings be started promptly; and in justice to those who have taken the time to prepare valuable papers, all who disturb the meetings by audible conversations should be spoken to kindly but firmly.

Let's do everything decently and in order. Remember how the Washington meetings went with clock-like precision.

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch, A. E. S., was held Saturday, January 10, 1931, at the Atlantic Hotel.

The meeting was called to order with President S. J. C. Trapp presiding and all officers present excepting our librarian, Mr. O. E. Servis, who was confined to his home due to an injury to his eyes.

Mr. H. Faint reported that the Lane Technical School laboratory could be had for the purpose of holding a chemistry class. The minimum number is 25 members and the class cannot drop below that number. He gave an outline of what he thought should be taken up this year, but left the final decision for the members of the class. Time is getting short, so come to meeting and help decide what form of study should be taken up this year.

Mr. H. Faint acted as librarian and found the following questions in the box:

Question—What causes a sludge to form on lead anodes in chrome sol.? Should this sludge be scrubbed off? What causes the sulphate to decrease in chrome sol.?

Answer—Clean anodes should be placed in sol. and current turned on at once to develop a black coating, which should not be cleaned off. If, however, a yellow colored coating is developed, it must be removed at once.

Decrease in sulphate is mostly lost through drag out.

Question—How can racks be stripped economically of alternate coatings of copper and nickel?

Answer—Two methods were suggested: the sulphuric acid strip with reverse current at about 50 degrees B, or the cyanide strip, also with reverse current. The success of the strip depends somewhat on the metal the rack is made out of.

Iron racks should strip very easily if taken care of say once or twice a week.

Question—What causes streaky deposits on cast iron in bright brass sol.?

Answer—Several suggestions were made: cut down load, build up sol., or flash cast iron in nickel.

J. C. KRETSCHMER, *Secretary and Treasurer.*

PROVIDENCE-ATTLEBORO BRANCH

At the meeting on Friday, December 19, the question of having a banquet was considered and it was decided that if we could make suitable arrangements we will have a banquet early in the spring. Lately, on the invitation of President Chace, we have held several meetings at his home; several other members have invited us to hold a meeting at their homes, and if anyone else is so situated that they can accommodate us, we would be glad to hear from them. This is a novel feature for the Providence-Attleboro Branch, and we believe that it tends to develop a better social feeling among the members. We are waiting to hear from more members about the class work before going ahead with that.

JOHN ANDREWS, *Secretary.*

ROCHESTER BRANCH

On Friday evening, December 19, Rochester Branch held its monthly meeting with President Reama in the chair.

Mr. G. A. Lux gave a report of the progress the boys were making in the chemistry class which was very encouraging. We only wish that some of our out-of-town members could attend a few of our Wednesday evening sessions. The chairmen of the Convention Committees reported they have selected the following members on their committees:

Hotel—Mr. Lopez, Mr. S. E. Felton.

Papers—Mr. Lopez, Mr. F. C. Mesle, Mr. W. A. Heinrich, Mr. R. E. Pettet, Mr. A. Thurber.

Publicity—Mr. F. J. Kohlmeier, Mr. F. Kolb, Mr. J. R. Elster, Mr. W. A. Guy, Mr. R. O. Warner.

Registration—Mr. J. R. Elster, Mr. H. A. Cameron, Mr. A. Doering, Mr. C. R. Wheeler, Mr. H. A. Gulbrandsen.

Transportation—Mr. W. D. Hart, Mr. F. A. Glitzer, Mr. Chas. Hehr, Mr. E. J. Beaudry, Mr. J. R. Snyder.

Entertainment—Mr. G. A. Lux, Mr. J. J. Desmond, Mr. Wm. Wolfe.

Printing and Program—Mr. Chas. Griffin, Mr. Ed. Crowley, Mr. Chas. Puffer.

Finance—Mr. G. A. Lux, Mr. C. A. Reama, Mr. Chas. Griffin.

With the committees at work we are expecting all who read this to be in Rochester next June. Make your plans early, as we want everyone to make a special effort to be here in Rochester, June 29-July 2.

CHAS. GRIFFIN, *Secretary.*

Convention News

The Rochester Branch of the Electro-Platers Society is well under way with the plans for the coming Convention to be held in Rochester from June 29th to July 2nd, 1931.

We hope this will be the largest and best Convention ever held by this Society. We are planning on having a large exhibit of finished products.

All those intending to exhibit kindly correspond with

MR. HARRY PUFFER,
56 Catalpa Road, Rochester, N. Y.

T. C. KOHLMEIER, *Chairman.*

HARTFORD-CONNECTICUT VALLEY BRANCH

The Hartford-Connecticut Valley Branch, A. E. S., held its December meeting on Monday evening, December 22, at the Indian Motorcycle Plant in Springfield, Mass.

The meeting was of much interest because it enabled the members of the Branch to inspect the new equipment purchased for the carrying on of the platers' class.

We were able to see the members of the class doing actual analytical work on plating solutions, under the guidance of Mr. Flowers, class instructor. The work for the evening was analyzing nickel solutions for metal and chlorides.

We enjoyed watching the work, also the report of the class secretary, as well as remarks upon the work the class was doing by Mr. Flowers. There were fourteen class members present.

After the platers' class, we held our regular Branch meeting, with President Beloin in the chair. Minutes of the previous meeting were read and accepted. No bills were presented. Communications were read and placed on file. Two applicants, Mr. Edw. Condel of Westfield, Mass., and Mr. James Byrnes, Jr., of Middletown, Conn., were elected as active members.

There being no speaker for the evening, time was spent in the discussion of plating problems. As the hour was growing late, the meeting was adjourned. There was an attendance of twenty-four members and visitors.

V. E. GRANT, *Secretary.*

LOS ANGELES BRANCH

The Los Angeles Branch held its regular monthly meeting as usual on the second Wednesday, December 10, at the Pig'n Whistle, with President C. E. Thornton in the chair.

The application of E. J. Wright was read and turned over to the Board of Managers for approval.

President C. E. Thornton stated that since he had changed positions which automatically made him an associate member he was compelled to hand the gavel to Vice-President E. W. Francis. Clarence is now salesman for Chas. F. L'Hommedieu & Sons Co.

There were three visitors present, Ralph McCracken, member of Indianapolis Branch, Peter Pitts of Chicago Branch, and F. L. Sheeley, representative of the Aetna Indemnity and Surety Co.

After regular business session the meeting was turned over to Earl Coffin, acting as librarian in the absence of Robert Gripp.

Mr. Sheeley gave a very interesting talk on "Compensation Insurance." He suggested an advisory board or committee be appointed to get a hearing before the "California Rating Board" if it is thought that rating of plating and polishing shops is too high. Also he suggested that each branch should send for a copy, No. 306, dealing with compensation from the Bureau of Labor of Statistics at Washington, D. C.

The question box contained the following questions:

Question—What causes a hot cyanide copper to be plate streaked?
Answer—Too much cyanide.
Question—What will harden the deposit in an arsenic black solution?
Answer—Add 1 oz. to gal. of sulfo-cyanide.
Question—Does an iron tank need a lining for cyanide copper solution?
Answer—No.
Question—Should sodium cyanide be dissolved in water before adding to a copper solution? Why?
Answer—Yes. Better dissolution or ionization.
Question—How can gravity of Cn solutions be kept from going too high?
Answer—Add HCn instead of NaCn.
The meeting adjourned at 10:30 p.m.

M. D. RYNKOFS, *Secretary.*

WATERBURY BRANCH

The first meeting in 1931 of Waterbury Branch, A. E. S., was held on January 9, and was well attended.

Meeting was called to order by Vice-President Barrie A. Hackett, who announced that owing to a misunderstanding in dates the speaker that was expected would be unable to attend. Communication from the Baltimore-Washington Branch relative to their coming educational session and banquet was read. Communication was read asking for information on the subject of hot nickel solutions. From the discussion brought out, it would seem that hot nickel solutions in use in this section were few and far between. There were those present who did not seem to think that their use was altogether practical, whilst others thought they were all right for some lines of work. The semi-annual report of supreme Secretary-Treasurer H. A. Gilbertson was read. An interesting circular was received from Mr. Jacob Hay, chairman of the Research Committee, emphasizing the importance of as many as possible attending the meeting of the American Society of Testing Materials to be held in Chicago January 16. Attention was called to the stand this organization took on plated work when they condemned same and advised hot galvanizing. Mr. Hay believes it is high time for the American Electro-Platers' Society to find out what constitutes a good electroplated deposit. Attention was called to the chromium plate that would not rust—but did. Recommends that new life be brought into our work by doing plating the proper way. An interesting discussion ensued the reading of the circular. The consensus of opinion seemed to be that the adoption of plating standards would be worthwhile.

Other subjects that were brought up for information and discussion were electrolytic pickling, vapor degreasing—ball burnishing, eliminating the necessity of rehandling the balls every batch—and the dyeing of aluminum with various colors.

Committee on speakers promises a treat to all who attend meeting Friday evening, February 13.

H. N. GUILFOILE, *Secretary.*

NEW YORK BRANCH

The regular meeting of New York Branch, A. E. S., was held at World Building, Park Row, December 12, 1930—F. Haushalter presiding.

Report of the banquet committee was given by Joe Musante, and reported progress. It was also decided to dispense with the booklet. It was voted on to dispense with the second meeting in December, owing to the holiday. As we had a speaker for the evening, the president turned the meeting over to the librarian under good and welfare, who introduced Dr. A. K. Graham. Dr. Graham spoke on plating problems, describing the three fundamental factors to successful plating, namely, composition of the solution, current density and cleaning of your work. Dr. Graham answered many questions which were interesting and was given a rising vote of thanks. We also had with us Dr. Pan.

HARRY SIMON, *Recording Secretary.*

The regular meeting of New York Branch, A. E. S., was held at World Building, Park Row, January 9, 1931—F. Haushalter presiding.

Received communication from Dr. Watts, asking the members for data on hot nickel solutions. Anyone using same please write our secretary or Dr. Watts.

Report of the Board of Trustees was given by Mr. Mac Stoker and accepted by the Branch.

Also report was given by our financial secretary, Mr. Sterling.

A request was made that the members get together and write some papers to present at our coming banquet. Several responded.

Meeting adjourned at 11 o'clock.

HARRY SIMON, *Recording Secretary.*

TOLEDO BRANCH

I have delayed announcing the fact that our Toledo Branch has a new meeting room which is in the Toledo Medical Building. It is equipped with a small laboratory where the members may go at any time to make an analysis of their solutions.

Thursday, January 8, the Toledo Branch held its regular meeting and voted to donate $50.00 a year, for three years, to the Research Fund.

A very interesting discussion of low pH nickel solution took place during this meeting. A few samples were shown and found to be excellent. The deposit was very ductile and appeared to be free from any pits or defects and very easy to buff. It seemed to be the opinion of everyone that the low pH solution is very good for heavy plating on steel.

More members are turning out for the meetings and more interest is shown each time. I believe that in the near future we will have something of real value to the A. E. S. Very truly yours,

JAMES M. LEE, *Secretary.*

We wish to thank Mr. Lee for this splendid report from Toledo Branch, and hope both the Branch meetings and platers' classes will continue to grow and prosper.—*Ed.*

CLEVELAND BRANCH

Cleveland Branch held its monthly meeting on Saturday evening, January 3, at Hotel Winton.

President E. Steen Thompson called the meeting to order at 7:30 p.m.

The minutes of the December meeting were approved as read.

The business of the meeting being concluded, our Librarian read a paper on the "Effects of Acids and Alkalis on Nickel Baths." After a short discussion, the meeting was turned over to Mr. H. J. TerDoest, who demonstrated a quick method of determining the nickel content of a plating solution.

This method, while not exact, is close enough for ordinary conditions.

Standard Ni. sol. 14 ozs. of single salts.
6 ozs. of sodium chloride.
4 ozs. of boric acid.
1 gal. of water.

Silver nitrate sol. 18.5 grams per liter.

Sodium cyanide sol. aprox. 1 oz. to 500 cc of water.

Adjust cyanide sol. so that 10 drops = 1 oz. of metalic Ni. per gal.

Method of analysis: Place 10 drops of Ni. sol. in test tube, add 10 cc of water, shake up. Add 2 drops of silver nitrate sol. This gives turbidity. Add cyanide sol. (counting drops) until sol. is just clear. Add 1 drop of nitrate sol. if sol. is still clear, then all the Ni. is down.

Each 10 drops of cyanide used = 1 oz. of Ni. per gal.

Mr. TerDoest was given a rising vote of thanks for his demonstration.

A motion to adjourn was carried at 10:30 p.m.

PAUL STAMM, *Secretary.*

DETROIT BRANCH

Detroit Branch held its regular monthly meeting, January 9, at the Statler Hotel—President Jos. H. Hansjoslen presiding.

The Branch was honored with the presence of Mr. Robert Kent of Utica, N. Y., consultant engineer with the Divine Bros. Co., who gave a very interesting talk on the important factors of automatic polishing machines, and also the choosing and the proper care of polishing wheels to meet each individual need, and laying particular stress on the importance of wheels being properly balanced, and also the care and selection of glue and abrasive.

The talk was well received by an attendance that filled the hall to overflowing, and Mr. Kent was given a rising vote of thanks.

On January 7, 23 members of Detroit Branch started as a class in Wilbur Wright High School, and under the instruction of Mr. Hahn will try to learn the methods of analyzing plating solutions.

Detroit Branch will hold an educational session and banquet in March. The date will be announced in the next report. An interesting and entertaining program is assured. All interested in electro-deposition are invited.

CHAS. M. PHILLIPS.

WHEN FEAR RULES THE WILL

HERBERT N. CASSON, editor of *Efficiency Magazine*, London, England, sends the following message to Americans concerning the present business slump:

You are depressed. You think you are crippled. You are afraid of the future. You are full of fears.

You have half the gold of the world and half of the machinery and most of the automobiles and all the skyscrapers.

You have the greatest home market in the world and the largest corporations that the world has ever seen. You are ruled by ideas and less by tradition than any other people in the world. You have usually done what you thought you could do.

How can it be possible that a progressive nation of 120,000,000 people can be wrecked by the speculations of a little handful in Wall Street? The prices that were forced too high had to come down. Today all prices are too low.

There is now a golden opportunity for every man who has eyes to see it. Dollars are now being sold for cents. Practically every security in the United States is now being sold at less than its value. The way to create a fortune is to buy from pessimists. Pay your money and take the risk.

Frick started his career by buying coke ovens in the slump of 1873. Carnegie made $300,000,000 by buying steel plants in slumps. Hundreds of fortunes have been made by buying from pessimists. In five years from now most American business men will belong to the "I wish I had" Club. Then it will be too late to buy a dollar for 30 cents. The opportunities will be gone.

When a horse balks, the balk is in its head, not in its legs. He moves on when he thinks he will. And when an American business man is depressed the slump is in his head. There is nothing serious to prevent him from making money if he thinks he will.

When fear rules the will nothing can be done, but when a man casts fear out of his mind the world becomes his oyster. To lose a bit of money is nothing, but to lose hope—or lose nerve and ambition—that is what makes men cripples.

This silly depression has gone on long enough. Get rid of it. It is inside of you. Rise and walk.

APPLICATIONS

Branch

ALBERT J. ROSENTHAL, 110 Porter Street, Bridgeport, Conn.....Bridgeport

ELECTIONS

EDWARD CONDEL, 2 Delance St., Westfield, Mass.....Hartford-Connecticut

JAMES BYRNES, Jr., 55 Loveland St., Middletown, Conn.
Hartford-Connecticut

CHARLES NARDOZZI, 48 Vermont St., Waterbury, Conn.....Waterbury

ROBERT EMMINGER, 35 Myrtle Ave., Waterbury, Conn.....Waterbury

RICHARD P. CRANE, 16 Cheny Ave., Waterbury, Conn. (Associate)
Waterbury

CHARLES R. BEAUBRON, 1219 Dime Bank Bldg., Detroit, Mich. (Associate)
Detroit

RESIGNATIONS

FRED PACKER, Southington, Connecticut.....Waterbury

SUSPENSIONS

JAMES N. CRIPPIN, MacGregor Darling Co., Plymouth, Indiana....Indianapolis

DEATHS

SILAS T. FORSCER, 1013 E. 148th St., Cleveland, Ohio.....Cleveland

TRANSFERS

CARL D. CLEAVER.....From Indianapolis Branch to Anderson Branch

For the Speakers:

'JEVER HEAR THIS ONE?

An old Negro preacher owned a mule which had an efficient pair of heels and a loud but unmusical voice.

One Sunday morning, while the preacher was delivering his sermon, the mule persisted in putting his head in at the window and braying loudly.

The preacher finally said: "Breddern and sistern, is dere one among you all who knows how to keep dat mule quiet?"

"Pahson," replied a man, "if you will jess tie a stone to dat mule's tail he sho will keep quiet."

"Breddern and sistern," said the preacher, "let him who is without sin tie de fust stone."

In a little Vermont town they were giving an entertainment for the benefit of the fund to supply chewing gum to the Brazil Indians. A dramatic reader and acrobatic dancer, who was passing the summer there, was prevailed upon to take part. She recited that old favorite, "The Village Blacksmith."

The selection was followed by tremendous cheering and the reader was about to respond to an encore, when a stalwart man came up the aisle and, motioning her to come to the edge of the platform, whispered in her ear: "I want you to do me a favor. Will you?"

"That depends on what it is," answered the young lady, sourly.

"Well," said the man, "I happen to be the 'village blacksmith' you've been talkin' about, an' I jest wanted to ask you to put in a verse sayin' that I also mend automobiles."

The farmer's three laborers were told to shift a rather heavily built chicken-house from the farmyard into an adjoining field.

"You take the front and I'll take the back," said Harry to Tom.

Tom agreed, and they started off across the yard. Presently, however, they were forced to take a rest, and they placed the house on the ground.

"Where's Bill got to?" inquired Harry, looking round for the third man.

Before Tom could reply a voice came from inside the chicken-house.

"Here," shouted Bill. "I'm carrying the perches."

She was a very plump widow with two charming daughters, and was beginning to wear her "weeds" lightly.

All the same, when the new curate called upon her she said: "Ah, I feel the loss of my poor, dear husband very much. I never have an appetite for anything now."

The curate was sympathetic, and, in an attempt to cheer her by pointing out what a comfort to her her daughters must be, replied: "I can quite understand that, but you are solaced in—"

"Sir!" interrupted the indignant woman, "allow me to inform you that I am not laced in at all."

It was a rare happening for the village fire brigade to be called out, and when Farmer Giles's barn caught fire the brigade superintendent felt his position keenly.

"Shall we turn on the hose?" asked his second in command.

"Not just yet, I think," the superintendent replied. "Better let it burn up a little, then we shall see what we are doing."

Two tramps met at the end of a long and unsuccessful day's begging. Both were tired and hungry.

"Didn't you make anything, Bill?" inquired one. "What about that house I saw you looking at—the big one with the open window?"

"Didn't trouble to ask," was the reply. "I looked in the window and saw two girls playing on one piano, so I guessed they was too poor for me to worry!"

It was the day before the annual cricket match between the rival village teams.

The vicar of the village and chairman of the home club called on the captain and gave him some money to buy a new ball and a new bat.

"That may help you to gain a few runs and take a few wickets," he told the captain.

The following afternoon, five minutes before the match had been advertised to commence, the vicar again approached the captain.

"Did you get the bat and ball?" he asked.

"No! Bats and balls won't help us," replied the captain emphatically. "I gave the money to the umpire."

"Oh, John!" screamed the excited woman driver, "the car is running away!"

"Can you stop it?" asked the worried husband.

"No."

"Well, then, see if you can't hit something cheap."

—*Dartmouth Jack O'Lantern.*

"Humph! Your papa is a shoemaker, and you haven't got any shoes?"

"Humph, yourself. Your papa is a dentist and your little sister's got only four teeth."

—*Texas Longhorn.*

VERSATILE

In England, a windmill lights the church and pumps the organ. In this country it often preaches the sermon. —*Claw.*

A SILLY QUESTION

"Is your baby a boy or a girl?"

"Of course, what else could it be?"

—*Stevens Stone Mill.*

IDEAS

My idea of a tightwad is a fellow who takes a girl out to lunch and casually remarks that she seems to be putting on weight.

My idea of a finished orator is one who knows enough to quit when he's finished.

My idea of a serious thinker is one who thinks seriously of marriage—after he is married—*Heavy Stuff.*

"Tommy, can you tell me one of the uses of cowhide?"

"Er, yessir. It keeps the cow together."

Boy Friend: "Those are beautiful clocks in your stockings."

Girl friend: "Yes, and they don't need any hands on them, either!"

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